Notes - Modeling with Exponentials

$f(x) = a \cdot b^x$ ← x: how many times / when

- a: initial amount
- b: what's happening to the initial amount

Percent Growth + Decay

- Always start from 100% and then add or subtract your % growth or decay
  - → Growth $b > 1$: 100% + % growth "appreciates" ☺
  - → Decay $0 < b < 1$: 100% − % decay "depreciate"
- Always turn your % into a decimal
  - ↳ divide by 100 / move the decimal two spaces left

b value

Ex: A house worth $120,000 is depreciating in value 6% each year.

A. Write an equation to model this

B. How much will the house be worth in 5 years?

A. $a = 120{,}000$ b. $100\% - 6\% = 94\% \Rightarrow 0.94$

$$f(x) = 120{,}000\,(0.94)^x \quad x = \#\text{ years}$$

B. $f(5) = 120000(0.94)^5 = \$88{,}068.48$

Ex 2: A pet store starts with 10 fish that double in population every 4 months.

A. Write an equation to model # fish after M months

B. How many fish will they have after 1 year?

A. $a = 10 \qquad b = 2$

$$f(M) = 10(2)^{\frac{M}{4}}$$

B. $f(12) = 10(2)^{\frac{12}{4}} = 10(2)^3 = 10(8) = \underline{80 \text{ fish}}$

↑ 12 months in a year

Months	# fish
0	10 ↓·2
4	20 ↓·2
8	40 ↓·2
*1 year 12	80

Ex 3: Compound Interest Formula $\boxed{A = P\left(1 + \frac{r}{n}\right)^{nt}}$

P = initial amount/principal r = interest rate (in decimal form)

n = # of times interest is compounded during the year t = # years

- My credit card has 18% interest compounded monthly. If my current statement is for \$2,081 and I don't pay it for 3 months. how much will I owe?

$P = 2{,}081 \qquad r = 0.18 \qquad n = 12 \qquad t = \frac{3}{12}$

$$A = 2081\left(1 + \frac{0.18}{12}\right)^{\frac{12 \cdot 3}{12}} = \boxed{\$2176.06}$$